

MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The REVIEW for August, 1896, is based on 2,746 reports from stations occupied by regular and voluntary observers, classified as follows: 149 from Weather Bureau stations; 33 from U. S. Army post surgeons; 2,421 from voluntary observers; 33 from Canadian stations; 1 from Hawaii; 96 received through the Southern Pacific Railway Company; 14 from U. S. Life-Saving stations. International simultaneous observations are received from a few stations and used together with trustworthy newspaper extracts and special reports.

The WEATHER REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe. Unless otherwise specifically noted, the text is written by the Editor, but the statistical tables are furnished by Mr. A. J. Henry, Chief of the Division of Records and Meteorological Data. Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada, Mr. Curtis J. Lyons, Meteorologist to the Government Survey, Honolulu, and of Dr. Mariano Bárcena, Director of the Central Meteorological Observatory of Mexico.

CLIMATOLOGY OF THE MONTH.

GENERAL CHARACTERISTICS.

The pressure has been rather high on both the Atlantic and Pacific coasts. The mean temperature was much above normal in the Gulf States and the interior valley; the highest mean temperatures and the highest maximum temperatures on record for August were reported from many stations in those regions and from some stations in New England and on the Pacific Coast. The lowest minimum temperatures for August were also reported at a few stations. The rainfall was below the normal in the Atlantic and Gulf States, many stations reporting the least on record for August; it was above normal in the Pacific Coast States, where most stations reported the largest rainfalls on record for August.

ATMOSPHERIC PRESSURE.

[In inches and hundredths.]

The distribution of mean atmospheric pressure reduced to sea level, as shown by mercurial barometers, not reduced to standard gravity, and as determined from observations taken daily at 8 a. m. and 8 p. m. (seventy-fifth meridian time), is shown by isobars on Chart IV. That portion of the reduction to standard gravity that depends on latitude is shown by the numbers printed on the right-hand border.

The *mean pressures* during the current month were highest in the South Atlantic States. They were lowest in Arizona. The highest were: Charleston, 30.11; Lynchburg, Savannah, Jupiter, Tampa, and Mobile, 30.09; Parkersburg, Wilmington, Atlanta, Jacksonville, Key West, New Orleans, and Galveston, 30.08. The lowest were: Prince Albert, 29.81; Yuma, 29.83; Phoenix, 29.87; Port Arthur and Miles City, 29.88; Winnipeg and Fresno, 29.89.

As compared with the *normal* for August, the mean pressure was in excess at all stations except a small portion of the upper Lake Region. The greatest excesses were: Helena, 0.11; Edmonston, 0.10; Charleston and Galveston, 0.09; Halifax,

Tampa, Mobile, New Orleans, and San Diego, 0.08. The greatest deficits were: Marquette, 0.06; Port Arthur, 0.05; Sault Ste. Marie, 0.04; Duluth, 0.03.

As compared with the *preceding month* of July, the pressures, reduced to sea level, show a rise in California and the Plateau Region, the lower Lakes, Middle States, and New England; pressures fell in the upper Lake Region and the South Atlantic States. The greatest rises were: Chatham and Charlottetown, 0.08; Sacramento and Red Bluff, 0.07; Sydney, Father Point, Eastport, Point Reyes Light, and Fresno, 0.06. The greatest falls were: Bermuda, 0.15; Jacksonville, 0.07; Hatteras, Wilmington, Jupiter, Tampa, 0.06; Kittyhawk, Charleston, Savannah, Atlanta, Montgomery, and Winnipeg, 0.05.

AREAS OF HIGH AND LOW PRESSURE.

By Prof. H. A. HAZEN.

During the month there were six areas of high pressure and ten of low pressure sufficiently well defined to be charted, and their trajectories will be found on Charts II and I. In addition there is given the position of each area twice each day, at 8 a. m. and 8 p. m., and the observed pressure nearest to the center. It should be noted that in the region of over 1,000 feet elevation in Canada the locations of all centers and the pressures are not homogeneous with respect to those in the United States, for the reason that in Canada the observed a. m. and p. m. temperatures are used in reducing the pressure to sea level, and this introduces an abnormal diurnal variation in the reduced pressure. For example, at Calgary (3,400 feet), a difference of 30° between a. m. and p. m. will introduce a variation of 0.19 inch in the reduction. On several days during the present month there seemed to be high areas in this region in the morning, which, however, entirely disappeared in the afternoon. Three of the high areas seemed to originate in the region of permanent high pressure, at this season off the north Pacific Coast. No. 1 originated in South

Dakota, and III and IV seem to have come down from the north of Montana. These highs, with the exception of I and VI, moved to the Gulf of St. Lawrence, and were absorbed there by a rather permanent high pressure area.

The storms, with the exception of I, III, and VI, originated or were first noted to the north of Montana, and almost all the tracks were to the north of the region of observation.

During the month the pressure was permanently high over the Gulf of Mexico; the lows were fairly well marked and generally without precipitation, while the areas of high pressure were of very slight magnitude.

The accompanying table gives the principal characteristics as regards the origin and disappearance of each high and low; also the velocity and duration:

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.							<i>Miles.</i>	<i>Days.</i>	<i>Miles.</i>	<i>Miles.</i>
I.....	1, a. m.	44	100	5, p. m.	32	76	1,790	4.5	398	16.6
II.....	8, p. m.	48	128	16, a. m.	44	58	3,560	7.5	474	19.8
III.....	14, a. m.	53	116	24, a. m.	47	55	4,090	10.0	409	17.0
IV.....	21, a. m.	53	120	27, p. m.	46	60	4,570	6.5	705	29.4
V.....	24, a. m.	46	123	31, a. m.	48	55	5,140	7.0	734	30.6
VI.....	28, a. m.	49	126	31, p. m.	42	95	1,800	3.5	514	21.4
Sums.....							30,950	39.0	3,234	
Mean of 6 paths.....									539	22.5
Mean of 39 days.....									537	22.4
Low areas.										
I.....	1, a. m.	42	89	3, a. m.	48	60	1,630	2.0	815	34.0
II.....	1, a. m.	53	109	4, a. m.	49	76	2,080	3.0	693	28.9
III.....	3, p. m.	39	104	8, a. m.	50	64	2,420	4.5	587	23.4
IV.....	6, p. m.	49	106	10, a. m.	48	64	2,440	3.5	698	29.1
V.....	8, a. m.	51	112	12, p. m.	45	70	3,260	4.5	725	30.2
VI.....	15, a. m.	50	87	17, p. m.	49	60	1,430	2.5	574	23.9
VII.....	19, p. m.	49	111	25, a. m.	46	59	3,670	5.5	667	27.8
VIII.....	23, p. m.	50	115	27, a. m.	48	72	2,310	3.5	660	27.5
IX.....	26, a. m.	51	130	28, p. m.	45	101	1,120	2.5	446	18.6
X.....	28, p. m.	52	113	31, a. m.	51	67	2,000	2.5	802	33.4
Sums.....							22,360	34.0	6,617	
Mean of 10 paths.....									662	27.6
Mean of 34 days.....									658	27.4

LOCAL STORMS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

1st.—*Ohio*: A series (four in number) of the most violent thunderstorms in the history of the local station visited Cincinnati and neighboring towns on the afternoon of this date. Hail, high winds, and heavy rain accompanied these storms. The second storm was almost tornadic in character. Damage to houses, trees and telegraph wires was great and widespread in the city and suburbs. *Iowa*: A severe thunderstorm passed over Keokuk during the night of July 31 and August 1. The wind reached an extreme velocity for one minute of 60 miles. Trees were broken, chimneys demolished, and several buildings injured. At the Fair Grounds, one and a half miles west, considerable damage was done to the buildings. All debris was carried from the northwest to the south-east.

1st.—*Tennessee*: A severe storm occurred a few miles west of Nashville, where the high wind blew down fences, out-buildings and trees. It was accompanied by a heavy fall of rain, badly damaging crops; the path of the storm was marked by great destruction.

2d.—*North Dakota*: A destructive tornado visited Walsh County about midnight of this date. Several houses, barns, and granaries were leveled to the ground. One child was killed and several persons were severely injured.

3d.—*Wyoming*: A wind storm with a maximum velocity of

40 miles per hour, accompanied by light rain, occurred at Lander. Telegraph lines were badly damaged.

3d.—*Minnesota*: A thunderstorm with very high wind occurred at Minneapolis during the night. A velocity of 90 miles per hour for a single minute was registered at 12.07 a. m. of the 4th. A few frail outhouses were unroofed, some trees blown down and basements flooded.

4th.—*Vermont*: It is reported that the most severe hailstorm in 43 years struck the town of Bradford, Merrimack County, at 2.30 in the afternoon, and in twenty minutes did a great deal of damage to buildings, trees, and fields of grain and corn. *Indiana*: The southern part of Wells County in the vicinity of Nottingham and Montpelier was visited by a hailstorm at 5 p. m. Much damage was done to oil derricks and buildings.

5th.—*Vermont*: A severe wind and rain storm passed over the city of Rutland, Rutland County, causing a great deal of damage along its track to shade trees, chimneys, and roofs of houses. *Illinois*: A thunderstorm with heavy rain occurred at Belvidere, Boone County. Six inches of rain fell in four hours, damaging crops and flooding bottom lands. The damage done to buildings by lightning will probably amount to many thousands of dollars. *Michigan*: A heavy rainstorm did considerable damage throughout Genesee County in the vicinity of Flint. Lightning damaged barns; crops were more or less injured. *Indiana*: A storm swept over Wells County. The greatest destruction was at Liberty Center. A church was partly wrecked; other buildings were damaged, trees and fruit destroyed, and fields of corn leveled.

5th.—*North Dakota*: Hail in the northeastern part of Logan County destroyed over 1,000 acres of standing grain.

6th.—*New York*: Warrensburg was visited by a heavy rainstorm, accompanied by a gale and destructive lightning. Several persons were shocked by the electric wires of a hotel. The storm was the most violent ever known in that section. A heavy rainstorm accompanied by severe winds and some hail swept over the vicinity of Springville, Erie Co., and did considerable damage. Two persons were injured. *Ohio*: A heavy rainstorm visited Springfield, Clark Co. The violence of the storm caused the suspension of all business for over an hour. A large number of trees, chimneys, and signs were blown down. A severe thunderstorm was reported from Hamilton, Butler Co. Lightning did much damage, and crops suffered severely from the heavy rainfall. In Wayne, Summit, Stark, Cuyahoga, and Ashtabula counties, thunderstorms were reported. *Michigan*: A severe storm passed over the southern part of Branch County. One person was killed by a falling tree.

6th.—*Indiana*: Richmond, Wayne Co., was visited by a storm of lightning, thunder, and rain. The rainfall was excessive, amounting almost to a cloudburst. The damage resulting is estimated at between \$75,000 and \$100,000. In the counties of Shelby, Union, and Randolph much damage was done to property and crops by lightning and floods.

8th.—*Michigan*: An unusually severe storm traveling from the west, struck Detroit at 8.30 a. m. It was characterized by high wind, intense and incessant lightning, and heavy thunder. Little damage was done in the city.

9th.—*Arkansas*: Following is a newspaper account of a storm which visited Berea, Ashley Co., on this date:

Storm indications were not very threatening at the time, and the wind was blowing with apparently little force, when, suddenly, without a moment's warning, an electric cloudburst or whirlwind wrenched the building from its foundation, leveled it to the ground, and disappeared without doing any other damage in the community except twisting the top from a large tree standing near the church, and destroying a few panels in an adjoining fence. One person, the minister, was killed, and several others injured.

Wisconsin: A thunderstorm passed over Milwaukee at 11.50 p. m. The force of the wind for a period of ten minutes was